PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G01N 33/53 — A2

(11) International Publication Number: **WO 99/61909**

(43) International Publication Date: 2 December 1999 (02.12.99)

(21) International Application Number: PCT/US99/11407

(22) International Filing Date: 26 May 1999 (26.05.99)

(30) Priority Data:
60/086,695 26 May 1998 (26.05.98) US

(71) Applicant *(for all designated States except US)*: THE GOVERNMENT OF THE UNITED STATES OF AMERICA, as represented by THE SECRETARY, DEPARTMENT OF HEALTH AND HUMAN SERVICES [US/US]; Centers for Disease Control and Prevention, Technology Transfer Office, Executive Park, Building 4, Suite 1103, Atlanta, GA 30329 (US).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: PAU, Chou-Pong [US/US]; 1142 Vistavia Circle, Decatur, GA 30033 (US).

(74) Agents: KULKARNI, Sima, Singadia et al.; Jones & Askew, LLP, 2400 Monarch Tower, 3424 Peachtree Road, N.E., Atlanta, GA 30326 (US).

(81) Designated States: AU, CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: METHODS AND COMPOSITIONS FOR THE DETECTION OF HUMAN HERPESVIRUS

(57) Abstract

Compositions and methods for the detection and diagnosis of infectious diseases are provided. In particular, efficient and sensitive compositions and methods for the detection of human herpesvirus 8 are provided. The claimed diagnostic compositions and methods involve the use of peptides representative of dominant antigenic regions of human herpesvirus in detection assays. Such assays are highly specific, sensitive and accurate.

Claims

1. A method of detecting the presence human herpesvirus 8 in a biological sample, said method comprising:

(a) contacting one or more isolated, immunogenic human herpesvirus 8 peptides with an antibody-containing biological sample, and

(b) detecting the formation of a complex between the immunogenic peptide and the antibody wherein the presence of a peptide-antibody complex indicates the presence of human herpesvirus 8.

2. The method of Claim 1, wherein the immunogenic peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NOS: 1-53, and conservative variations thereof.

3. The method of Claim 2, wherein the immunogenic peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NOS: 5, 6, 19, 22, 23, 24 and 25 and conservative variations thereof.

4. The method of Claim 1, wherein the peptide is bound to a solid phase.

5. The method of Claim 1, wherein the peptide is labeled.

6. The method of Claim 5, wherein the label is selected from the group consisting of an electrochemiluminescent label, a chemiluminescent label, an enzymatic label, a bioluminescent label, and a fluorescent label.

7. The method of Claim 1, further comprising incubating the peptide-antibody complex with a second antibody specific for the peptide, wherein the second antibody is labeled with a detectable label and binds to the peptide-antibody complex.

8. The method of Claim 7, wherein the label is selected from the group consisting of an electrochemiluminescent label, a chemiluminescent label, an enzymatic label, a bioluminescent label, and a fluorescent label.

9. The method of Claim 1, wherein the biological sample comprises wounds, blood, tissues, saliva, semen, tears, urine, bone, muscle, cartilage, or skin.

10. An immunogenic composition comprising a pharmaceutically acceptable carrier and an isolated, immunogenic human herpesvirus 8 peptide in an amount sufficient to induce a protective immune response to human herpesvirus 8 in a mammal, said immunogenic peptide comprising an amino acid sequence selected from the group consisting of SEQ ID NOS: 1-53, and conservative variations thereof.

11. The composition of Claim 10, wherein the immunogenic peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NOS: 5, 6, 19, 22, 23, 24 and 25 and conservative variations thereof.

12. The composition of Claim 10, wherein the immunogenic peptide is conjugated to a carrier protein.

13. An isolated, immunogenic human herpesvirus 8 peptide, said immunogenic peptide comprising an amino acid sequence selected from the group consisting of SEQ ID NOS: 1-53, and conservative variations thereof.

14. The immunogenic peptide in accordance with claim 11, wherein said immunogenic peptide binds to an antibody specifically immunoreactive with a peptide selected from the group consisting of SEQ ID NOS: 1-53, and conservative variations thereof.

15. The immunogenic peptide in accordance with claim 11, wherein said immunogenic peptide is used to detect the presence of human herpesvirus 8 antibodies in a biological sample comprising wounds, blood, tissues, saliva, semen, tears, urine, bone, muscle, cartilage, or skin.

16. An isolated antibody capable of binding to a human herpesvirus 8 immunogenic peptide.

17. The isolated antibody of Claim 16, wherein the immunogenic peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NOS: 1-53, and conservative variations thereof.

18. The isolated antibody of Claim 16, wherein the immunogenic peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NOS: 5, 6, 19, 22, 23, 24 and 25 and conservative variations thereof.

19. The isolated antibody of Claim 16, wherein the antibody is isolated from a biological sample comprising wounds, blood, tissues, saliva, semen, tears, urine, bone, muscle, cartilage, or skin.

20. The isolated antibody of Claim 16, wherein the antibody is a monoclonal antibody.

SEQUENCE LISTING

<110> The G vernment of the United States of America
<120> Methods and Compositions for the Detecti n of Human Herp svirus
<130> 03063-0471WP
<140> 1
<141> 1999-05-26
<150> 60/086,695
<151> 1998-05-26
<160> 53
<170> PatentIn Ver. 2.0
<210> 1
<211> 170
<212> PRT
<213> Human Herpesvirus Type 8
<400> 1

```
Met Ser Asn Phe Lys Val Arg Asp Pro Val Ile Gln Glu Arg Leu Asp
 1               5                  10                  15
His Asp Tyr Ala His His Pro Leu Val Ala Arg Met Asn Thr Leu Asp
            20                  25                  30
Gln Gly Asn Met Ser Gln Ala Glu Tyr Leu Val Gln Lys Arg His Tyr
        35                  40                  45
Leu Val Phe Leu Ile Ala His His Tyr Tyr Glu Ala Tyr Leu Arg Arg
    50                  55                  60
Met Gly Gly Ile Gln Arg Arg Asp His Leu Gln Thr Leu Arg Asp Gln
65                  70                  75                  80
Lys Pro Arg Glu Arg Ala Asp Arg Val Ser Ala Ala Ser Ala Tyr Asp
                85                  90                  95
Ala Gly Thr Phe Thr Val Pro Ser Arg Pro Gly Pro Ala Ser Gly Thr
            100                 105                 110
Thr Pro Gly Gly Gln Asp Ser Leu Gly Val Ser Gly Ser Ser Ile Thr
        115                 120                 125
Thr Leu Ser Ser Gly Pro His Ser Leu Ser Pro Ala Ser Asp Ile Leu
    130                 135                 140
Thr Thr Leu Ser Ser Thr Thr Glu Thr Ala Ala Pro Ala Val Ala Asp
145                 150                 155                 160
Ala Arg Lys Pro Pro Ser Gly Lys Lys Lys
                165                 170
```

<210> 2
<211> 197
<212> PRT
<213> Human Herpesvirus Type 8
<400> 2

```
Met Ser Ser Thr Gln Ile Arg Thr Glu Ile Pro Val Ala Leu Leu Ile
 1               5                  10                  15
Leu Cys Leu Cys Leu Val Ala Cys His Ala Asn Cys Pro Thr Tyr Arg
            20                  25                  30
Ser His Leu Gly Phe Trp Gln Glu Gly Trp Ser Gly Gln Val Tyr Gln
        35                  40                  45
Asp Trp Leu Gly Arg Met Asn Cys Ser Tyr Glu Asn Met Thr Ala Leu
    50                  55                  60
```

```
Glu Ala Val Ser Leu Asn Gly Thr Arg Leu Ala Ala Gly Ser Pro Ser
 65                  70                  75                  80
Ser Glu Tyr Pro Asn Val Ser Val Ser Val Glu Asp Thr Ser Ala Ser
                85                  90                  95
Gly Ser Gly Glu Asp Ala Ile Asp Glu Ser Gly Ser Gly Glu Glu Glu
            100                 105                 110
Arg Pro Val Thr Ser His Val Thr Phe Met Thr Gln Ser Val Gln Ala
        115                 120                 125
Thr Thr Glu Leu Thr Asp Ala Leu Ile Ser Ala Phe Ser Gly Val Leu
    130                 135                 140
His Val Ser Thr Val Ile Pro Arg Asn Trp Val Asn Arg Arg Cys Val
145                 150                 155                 160
Gly Ile Lys Arg Asn Leu Thr Phe Cys Leu Ile Tyr Arg Ile Ile Phe
                165                 170                 175
Ile Trp Gly Thr Ile Gln Asp His Ala Asn Ser Arg Ile Thr Gly Arg
            180                 185                 190
Arg Lys Arg Gln Lys
        195
```

<210> 3
<211> 34
<212> PRT
<213> Human Herpesvirus Type 8
<400> 3

```
Ala Ala Ser Ala Tyr Asp Ala Gly Thr Phe Thr Val Pro Ser Arg Pro
  1               5                  10                  15
Gly Pro Ala Ser Gly Thr Thr Pro Gly Gly Gln Asp Ser Leu Gly Val
            20                  25                  30
Ser Gly
```

<210> 4
<211> 31
<212> PRT
<213> Human Herpesvirus Type 8
<400> 4

```
Gln Asp Ser Leu Gly Val Ser Gly Ser Ser Ile Thr Thr Leu Ser Ser
  1               5                  10                  15
Gly Pro His Ser Leu Ser Pro Ala Ser Asp Ile Leu Thr Thr Leu
            20                  25                  30
```

<210> 5
<211> 31
<212> PRT
<213> Human Herpesvirus Type 8
<400> 5

```
Ala Ser Asp Ile Leu Thr Thr Leu Ser Ser Thr Thr Glu Thr Ala Ala
  1               5                  10                  15
Pro Ala Val Ala Asp Ala Arg Lys Pro Pro Ser Gly Lys Lys Lys
            20                  25                  30
```

<210> 6
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 6
Ala Val Ala Asp Ala Arg Lys Pro Pro Ser Gly Lys Lys Lys
1 5 10

<210> 7
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 7
Ala Val Ala Gly Ala Arg Lys Pro Pro Ser Gly Lys Lys Lys
1 5 10

<210> 8
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 8
Ala Val Ala Asp Leu Arg Lys Pro Pro Ser Gly Lys Lys Lys
1 5 10

<210> 9
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 9
Ala Val Ala Asp Ala Gly Lys Pro Pro Ser Gly Lys Lys Lys
1 5 10

<210> 10
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 10
Ala Val Ala Asp Ala Arg Gly Pro Pro Ser Gly Lys Lys Lys
1 5 10

<210> 11
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 11
Ala Val Ala Asp Ala Arg Lys Gly Pro Ser Gly Lys Lys Lys
1 5 10

<210> 12
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 12
Ala Val Ala Asp Ala Arg Lys Pro Gly Ser Gly Lys Lys Lys
1 5 10

<210> 13
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 13
Ala Val Ala Asp Ala Arg Lys Pro Pro Gly Gly Lys Lys Lys
1 5 10

<210> 14
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 14
Ala Val Ala Asp Ala Arg Lys Pro Pro Ser Leu Lys Lys Lys
1 5 10

<210> 15
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 15
Ala Val Ala Asp Ala Arg Lys Pro Pro Ser Gly Gly Lys Lys
1 5 10

<210> 16
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 16
Ala Val Ala Asp Ala Arg Lys Pro Pro Ser Gly Lys Gly Lys
1 5 10

<210> 17
<211> 14
<212> PRT
<213> Human Herpesvirus Type 8
<400> 17
Ala Val Ala Asp Ala Arg Lys Pro Pro Ser Gly Lys Lys Gly
1 5 10

<210> 18
<211> 8

<212> PRT
<213> Human Herpesvirus Type 8
<400> 18
Arg Lys Pro Pro Ser Gly Lys Lys
1 5

<210> 19
<211> 31
<212> PRT
<213> Human Herpesvirus Type 8
<400> 19
Arg Ser His Leu Gly Phe Trp Gln Glu Gly Trp Ser Gly Gln Val Tyr
1 5 10 15
Gln Asp Trp Leu Gly Arg Met Asn Cys Ser Tyr Glu Asn Met Thr
20 25 30

<210> 20
<211> 60
<212> PRT
<213> Human Herpesvirus Type 8
<400> 20
Met Asp Arg Gly Leu Thr Val Phe Val Ala Val His Val Pro Asp Val
1 5 10 15
Leu Leu Asn Gly Trp Arg Trp Arg Leu Gly Ala Ile Pro Pro Leu Val
20 25 30
Cys Leu Leu Ala Ile Ser Val Val Pro Pro Ser Gly Gln Arg Gly Pro
35 40 45
Val Ala Phe Arg Thr Arg Val Ala Thr Gly Ala His
50 55 60

<210> 21
<211> 1162
<212> PRT
<213> Human Herpesvirus Type 8
<400> 21
Met Ala Pro Pro Gly Met Arg Leu Arg Ser Gly Arg Ser Thr Gly Ala
1 5 10 15
Pro Leu Thr Arg Gly Ser Cys Arg Lys Arg Asn Arg Ser Pro Glu Arg
20 25 30
Cys Asp Leu Gly Asp Asp Leu His Leu Gln Pro Arg Arg Lys His Val
35 40 45

Ala Asp Ser Ile Asp Gly Arg Glu Cys Gly Pro His Thr Leu Pro Ile
50 55 60
Pro Gly Ser Pro Thr Val Phe Thr Ser Gly Leu Pro Ala Phe Val Ser
65 70 75 80

```
Ser Pro Thr Leu Pro Val Ala Pro Ile Pro Ser Pro Ala Pro Ala
                 85                  90                  95
Pro Leu Pro Pro Pro Ala Leu Leu Pro Pro Val Thr Thr Ser Ser Ser
            100                 105                 110
Pro Ile Pro Pro Ser His Pro Val Ser Pro Gly Thr Thr Asp Thr His
        115                 120                 125
Ser Pro Ser Pro Ala Leu Pro Pro Thr Gln Ser Pro Glu Ser Ser Gln
    130                 135                 140
Arg Pro Pro Leu Ser Ser Pro Thr Gly Arg Pro Asp Ser Ser Thr Pro
145                 150                 155                 160
Met Arg Pro Pro Pro Ser Gln Gln Thr Thr Pro Pro His Ser Pro Thr
                165                 170                 175
Thr Pro Pro Pro Glu Pro Pro Ser Lys Ser Ser Pro Asp Ser Leu Ala
            180                 185                 190
Pro Ser Thr Leu Arg Ser Leu Arg Lys Arg Arg Leu Ser Ser Pro Gln
        195                 200                 205
Gly Pro Ser Thr Leu Asn Pro Ile Cys Gln Ser Pro Pro Val Ser Pro
210                 215                 220
Pro Arg Cys Asp Phe Ala Asn Arg Ser Val Tyr Pro Pro Trp Ala Thr
225                 230                 235                 240
Glu Ser Pro Ile Tyr Val Gly Ser Ser Ser Asp Gly Asp Thr Pro Pro
                245                 250                 255
Arg Gln Pro Pro Thr Ser Pro Ile Ser Ile Gly Ser Ser Ser Pro Ser
            260                 265                 270
Glu Gly Ser Trp Gly Asp Asp Thr Ala Met Leu Val Leu Leu Ala Glu
        275                 280                 285
Ile Ala Glu Glu Ala Ser Lys Asn Glu Lys Glu Cys Ser Glu Asn Asn
    290                 295                 300
Gln Ala Gly Glu Asp Asn Gly Asp Asn Glu Ile Ser Lys Glu Ser Gln
305                 310                 315                 320
Val Asp Lys Asp Asp Asn Asp Asn Lys Asp Asp Glu Glu Glu Gln Glu
                325                 330                 335
Thr Asp Glu Glu Asp Glu Glu Asp Asp Glu Glu Asp Asp Glu Glu Asp
            340                 345                 350
Asp Glu Glu Asp Asp Glu Glu Asp Asp Glu Glu Asp Asp Glu Glu Asp
        355                 360                 365
Asp Glu Glu Asp Asp Glu Glu Asp Asp Glu Glu Asp Asp Glu Glu Asp
    370                 375                 380
Asp Glu Glu Glu Asp Glu Glu Glu Asp Glu Glu Glu Asp Glu Glu Glu
385                 390                 395                 400
Glu Asp Glu Glu Asp Asp Asp Asp Glu Asp Asn Glu Asp Glu Glu Asp
                405                 410                 415
Asp Glu Glu Glu Asp Lys Lys Glu Asp Glu Glu Asp Gly Gly Asp Gly
            420                 425                 430
Asn Lys Thr Leu Ser Ile Gln Ser Ser Gln Gln Gln Gln Glu Pro Gln
        435                 440                 445
Gln Gln Glu Pro Gln Gln Gln Glu Pro Gln Gln Gln Glu Pro Leu Gln
    450                 455                 460
Glu Pro Gln Gln Gln Glu Pro Gln Gln Gln Glu Pro Gln Gln Gln Glu
465                 470                 475                 480
Pro Leu Gln Glu Pro Gln Gln Gln Glu Pro Gln Gln Gln Glu Pro Leu
                485                 490                 495
Gln Glu Pro Gln Gln Gln Glu Pro Gln Gln Gln Glu Pro Gln Gln Gln
            500                 505                 510
Glu Pro Gln Gln Gln Glu Pro Gln Gln Gln Glu Pro Gln Gln Gln Glu
        515                 520                 525
Pro Gln Gln Gln Glu Pro Gln Gln Gln Glu Pro Gln Gln Gln Glu Pro
    530                 535                 540
Gln Gln Gln Glu Pro Gln Gln Arg Glu Pro Gln Gln Arg Glu Pro Gln
545                 550                 555                 560
```

```
Gln Arg Glu Pro Gln Gln Arg Glu Pro Gln Gln Arg Glu Pro Gl  Gln
                565                 570                 575
Arg Glu Pro Gln Gln Arg Glu Pro Gln Gln Arg Glu Pro Gln Gln Arg
            580                 585                 590
Glu Pro Gln Gln Gln Asp Glu Gln Gln Gln Asp Glu Gln Gln Gln Asp
        595                 600                 605
Glu Gln Gln Gln Asp Glu Gln Gln Gln Asp Glu Gln Gln Gln Asp Glu
    610                 615                 620
Gln Gln Gln Asp Glu Gln Gln Gln Asp Glu Gln Gln Gln Asp Glu Gln
625                 630                 635                 640
Gln Gln Asp Glu Gln Gln Gln Asp Glu Gln Gln Gln Asp Glu Gln Gln
                645                 650                 655
Gln Asp Glu Gln Gln Gln Asp Glu Gln Gln Gln Asp Glu Gln Gln Gln
660                 665                 670
Asp Glu Gln Gln Gln Asp Glu Gln Gln Gln Asp Glu Gln Gln Gln Asp
        675                 680                 685
Glu Gln Gln Gln Asp Glu Gln Gln Gln Asp Glu Gln Glu Gln Gln Asp
    690                 695                 700
Glu Gln Glu Gln Gln Asp Glu Gln Glu Gln Gln Asp Glu Gln Gln Gln
705                 710                 715                 720
Asp Glu Gln Gln Gln Gln Asp Glu Gln Gln Gln Gln Asp Glu Gln Gln
                725                 730                 735
Gln Gln Asp Glu Gln Gln Gln Gln Asp Glu Gln Gln Gln Gln Asp Glu
            740                 745                 750
Gln Glu Gln Gln Glu Glu Gln Glu Gln Gln Glu Glu Gln Glu Gln Glu
755                 760                 765
Leu Glu Glu Gln Glu Gln Glu Leu Glu Asp Gln Glu Gln Glu Leu Glu
    770                 775                 780
Glu Gln Glu Gln Glu Leu Glu Glu Gln Glu Gln Glu Leu Glu Glu Gln
785                 790                 795                 800
Glu Gln Glu Leu Glu Glu Gln Glu Gln Glu Leu Glu Glu Gln Glu Gln
                805                 810                 815
Glu Leu Glu Glu Gln Glu Gln Glu Leu Glu Glu Gln Glu Gln Glu Leu
820                 825                 830
Glu Glu Gln Glu Gln Glu Leu Glu Glu Gln Glu Val Glu Glu Gln Glu
        835                 840                 845
Gln Glu Val Glu Glu Gln Glu Gln Glu Gln Glu Glu Gln Glu Leu Glu
    850                 855                 860
Glu Val Glu Glu Gln Glu Gln Glu Gln Glu Glu Gln Glu Glu Gln Glu
865                 870                 875                 880
Leu Glu Glu Val Glu Glu Gln Glu Glu Gln Glu Leu Glu Glu Val Glu
885                 890                 895
Glu Gln Glu Glu Gln Glu Leu Glu Glu Val Glu Glu Gln Glu Gln Gln
            900                 905                 910
Glu Leu Glu Glu Val Glu Glu Gln Glu Gln Gln Gly Val Glu Gln Gln
        915                 920                 925
Glu Gln Glu Thr Val Glu Glu Pro Ile Ile Leu His Gly Ser Ser Ser
    930                 935                 940
Glu Asp Glu Met Glu Val Asp Tyr Pro Val Val Ser Thr His Glu Gln
945                 950                 955                 960
Ile Ala Ser Ser Pro Pro Gly Asp Asn Thr Pro Asp Asp Asp Pro Gln
                965                 970                 975
Pro Gly Pro Ser Arg Glu Tyr Arg Tyr Val Leu Arg Thr Ser Pro Pro
            980                 985                 990
His Arg Pro Gly Val Arg Met Arg Arg Val Pro Val Thr His Pro Lys
        995                1000                1005
Lys Pro His Pro Arg Tyr Gln Gln Pro Pro Val Pro Tyr Arg Gln Ile
   1010                1015                1020
Asp Asp Cys Pro Ala Lys Ala Arg Pro Gln His Ile Phe Tyr Arg Arg
1025                1030                1035                1040
```

```
Phe Leu Gly Lys Asp Gly Arg Arg Asp Pro Lys Cys Gln Trp Lys Phe
                1045                1050                1055
Ala Val Ile Phe Trp Gly Asn Asp Pro Tyr Gly Leu Lys Lys Leu Ser
            1060                1065                1070
Gln Ala Phe Gln Phe Gly Gly Val Lys Ala Gly Pro Val Ser Cys Leu
        1075                1080                1085
Pro His Pro Gly Pro Asp Gln Ser Pro Ile Thr Tyr Cys Val Tyr Val
    1090                1095                1100
Tyr Cys Gln Asn Lys Asp Thr Ser Lys Lys Val Gln Met Ala Arg Leu
1105                1110                1115                1120
Ala Trp Glu Ala Ser His Pro Leu Ala Gly Asn Leu Gln Ser Ser Ile
                1125                1130                1135
Val Lys Phe Lys Lys Pro Leu Pro Leu Thr Gln Pro Gly Glu Asn Gln
            1140                1145                1150


Gly Pro Gly Asp Ser Pro Gln Glu Met Thr
        1155                1160

<210> 22
<211> 228
<212> PRT
<213> Human Herpesvirus Type 8
<400> 22
Met Ser Ser Thr Gln Ile Arg Thr Glu Ile Pro Val Ala Leu Leu Ile
  1               5                  10                  15
Leu Cys Leu Cys Leu Val Ala Cys His Ala Asn Cys Pro Thr Tyr Arg
             20                  25                  30
Ser His Leu Gly Phe Trp Gln Glu Gly Trp Ser Gly Gln Val Tyr Gln
         35                  40                  45
Asp Trp Leu Gly Arg Met Asn Cys Ser Tyr Glu Asn Met Thr Ala Leu
     50                  55                  60
Glu Ala Val Ser Leu Asn Gly Thr Arg Leu Ala Ala Gly Ser Pro Ser
 65                  70                  75                  80
Ser Glu Tyr Pro Asn Val Ser Val Ser Val Glu Asp Thr Ser Ala Ser
                 85                  90                  95
Gly Ser Gly Glu Asp Ala Ile Asp Glu Ser Gly Ser Gly Glu Glu Glu
100                 105                 110

Arg Pro Val Thr Ser His Val Thr Phe Met Thr Gln Ser Val Gln Ala
        115                 120                 125
Thr Thr Glu Leu Thr Asp Ala Leu Ile Ser Ala Phe Ser Gly Ser Tyr
    130                 135                 140
Ser Ser Gly Glu Pro Ser Arg Thr Thr Arg Ile Arg Val Ser Pro Val
145                 150                 155                 160
Ala Glu Asn Gly Arg Asn Ser Gly Ala Ser Asn Arg Val Pro Phe Ser
                165                 170                 175
```

```
Ala Thr Thr Thr Thr Thr Arg Gly Arg Asp Ala His Tyr Asn Ala Glu
            180                 185                 190
Ile Arg Thr His Leu Tyr Ile Leu Trp Ala Val Gly Leu Leu Leu Gly
        195                 200                 205
Leu Val Leu Ile Leu Tyr Leu Cys Val Pro Arg Cys Arg Arg Lys Lys
    210                 215                 220
Pro Tyr Ile Val
225
```

<210> 23
<211> 167
<212> PRT
<213> Human Herpesvirus Type 8
<400> 23

```
Met Ser Ser Thr Gln Ile Arg Thr Glu Ile Pro Val Ala Leu Leu Ile
  1               5                  10                  15
Leu Cys Leu Cys Leu Val Ala Cys His Ala Asn Cys Pro Thr Tyr Arg
             20                  25                  30
Ser His Leu Gly Phe Trp Gln Glu Gly Trp Ser Gly Gln Val Tyr Gln
         35                  40                  45
Asp Trp Leu Gly Arg Met Asn Cys Tyr Ser Glu Asn Met Thr Ala Leu
     50                  55                  60
Glu Ala Val Ser Leu Asn Gly Thr Arg Leu Ala Ala Gly Ser Pro Ser
 65                  70                  75                  80
Arg Ser Tyr Ser Ser Gly Glu Pro Ser Arg Thr Thr Arg Ile Arg Val
                 85                  90                  95
Ser Pro Val Ala Glu Asn Gly Arg Asn Ser Gly Ala Ser Asn Arg Val
            100                 105                 110
Pro Phe Ser Ala Thr Thr Thr Thr Thr Arg Gly Arg Asp Ala His Tyr
        115                 120                 125
Asn Ala Glu Ile Arg Thr His Leu Tyr Ile Leu Trp Ala Val Gly Leu
    130                 135                 140
Leu Leu Gly Leu Val Leu Ile Leu Tyr Leu Cys Val Pro Arg Cys Arg
145                 150                 155                 160
Arg Lys Lys Pro Tyr Ile Val
                165
```

<210> 24
<211> 20
<212> PRT
<213> Human Herpesvirus Type 8
<400> 24

```
Gln Glu Gly Trp Ser Gly Gln Val Tyr Gln Asp Trp Leu Gly Arg Met
  1               5                  10                  15
Asn Cys Ser Tyr
             20
```

<210> 25
<211> 34
<212> PRT
<213> Human Herpesvirus Type 8
<400> 25

```
Ser His Leu Gly Phe Trp Gln Glu Gly Trp Ser Gly Gln Val Tyr Gln
  1               5                  10                  15
Asp Trp Leu Gly Arg Met Asn Cys Tyr Ser Glu Ser Ser Thr Thr Glu
             20                  25                  30
Thr Ala
```

<210> 26

<211> 20
<212> PRT
<213> Human Herpesvirus Type 8
<400> 26
His Ala Asn Cys Pr Thr Tyr Arg Ser His Leu Gly Phe Trp Gln Glu
1 5 10 15
Gly Trp Ser Gly
20

<210> 27
<211> 20
<212> PRT
<213> Human Herpesvirus Type 8
<400> 27
Met Asn Cys Ser Tyr Glu Asn Met Thr Ala Leu Glu Ala Val Ser Leu
1 5 10 15
Asn Gly Thr Arg

20

<210> 28
<211> 20
<212> PRT
<213> Human Herpesvirus Type 8
<400> 28
Leu Asn Gly Thr Arg Leu Ala Ala Gly Ser Pro Ser Ser Glu Tyr Pro
1 5 10 15
Asn Val Ser Val
20
<210> 29
<211> 22
<212> PRT
<213> Human Herpesvirus Type 8
<400> 29
Tyr Pro Asn Val Ser Val Ser Val Glu Asp Thr Ser Ala Ser Gly Ser
1 5 10 15
Gly Glu Asp Ala Ile Asp
20

<210> 30
<211> 22
<212> PRT
<213> Human Herpesvirus Type 8
<400> 30
Gly Glu Asp Ala Ile Asp Glu Ser Gly Ser Gly Glu Glu Glu Arg Pro
1 5 10 15
Val Thr Ser His Val Thr
20

<210> 31
<211> 20
<212> PRT
<213> Human Herpesvirus Type 8
<400> 31
Val Thr Ser His Val Thr Phe Met Thr Gln Ser Val Gln Ala Thr Thr
1 5 10 15
Glu Leu Thr Asp

20

<210> 32
<211> 20
<212> PRT
<213> Human Herpesvirus Type 8
<400> 32
Thr Thr Glu Leu Thr Asp Ala Leu Ile Ser Ala Phe Ser Gly Ser Tyr
1 5 10 15
Ser Ser Gly Glu

20

<210> 33
<211> 20
<212> PRT
<213> Human Herpesvirus Type 8
<400> 33
Gly Ser Tyr Ser Ser Gly Glu Pro Ser Arg Thr Thr Arg Ile Arg Val
1 5 10 15
Ser Pro Val Ala
20

<210> 34
<211> 20
<212> PRT
<213> Human Herpesvirus Type 8
<400> 34
Arg Ile Arg Val Ser Pro Val Ala Glu Asn Gly Arg Asn Ser Gly Ala
1 5 10 15
Ser Asn Arg Val
20

<210> 35
<211> 20
<212> PRT
<213> Human Herpesvirus Type 8
<400> 35
Asn Ser Gly Ala Ser Asn Arg Val Pro Phe Ser Ala Thr Thr Thr Thr
1 5 10 15
Thr Arg Gly Arg
20

<210> 36
<211> 20
<212> PRT
<213> Human Herpesvirus Type 8
<400> 36

Thr Thr Thr Thr Thr Arg Gly Arg Asp Ala His Tyr Asn Ala Glu Ile
1 5 10 15
Arg Thr His Leu
20

<210> 37
<211> 20
<212> PRT
<213> Human Herpesvirus Type 8
<400> 37
Gln Glu Val Trp Ser Gly Gln Val Tyr Gln Asp Trp Leu Gly Arg Met
1 5 10 15